

## THE PRINCIPLES OF PHYTOGEOGRAPHIC NOMENCLATURE.<sup>1</sup>

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THE confusion prevailing within the nomenclature of phytogeography has of late been repeatedly brought up for discussion. A unanimous opinion exists as to the disadvantages resulting from the present chaotic terminology. Such a diversity of ideas prevails that every writer is obliged to explain in what sense he has used a technical term, and if he omits an explanation we are often left in doubt as to the interpretation of the expression used. An agreement has to be arrived at, sooner or later, and the sooner there is an end to the present disorder, the better for the progress of phytogeography and all concerned.

This science is still in its infancy and very few of its doctrines are settled beyond doubt. We meet with contradictory views at every step. Sweeping generalizations, often based upon very imperfect observations, and described in vague and uncertain terms, full of ambiguities, threaten the development of this important science. Its advancement and success depend upon well-settled methods of investigation and description. The necessity of adopting a nomenclature similar to that of other descriptive sciences is obvious. The prevalent fault of which we complain is not the absence of names and technical terms, but of the defective definition of the terms now in use. It has always been much easier to offer censure than to correct mistakes, easier to state evils than to relieve them. My object in this paper is not to give any proposals as to the detailed arrangement of phytogeographical nomenclature, but to discuss some of the general principles which ought to prevail in any attempt to revise the nomenclature so as to meet the present demands of the science. I have elsewhere, in papers appearing simultaneously with this, drawn attention to the terminology of certain phytogeographical phenomena.

<sup>1</sup> Read before Section G of the American Association for the Advancement of Science, Philadelphia meeting, December 30, 1904.

Since the appearance of the papers of WARBURG, FLAHAULT, NILSSON, and CLEMENTS on this vexed question of nomenclature, it could have been expected that some discussion would arise, but instead it seems as if phytogeographers were content with the opinions brought forward, although these are by no means harmonious. The object of plant geography is the study of the distribution of plants, and of the laws that govern this distribution, not wrestling with words nor philological hair-splitting. But it cannot be denied, as I have just said, and as is generally conceded, that this science needs uniformity of expression; how to obtain this is the problem.

The next international congress, to be assembled at Vienna in June 1905, is to take this matter under consideration. Some of the foremost phytogeographers of the world constitute a committee which is to make a report and submit certain proposals that may or may not lead to a solution of the problem. It is only the general principles, however, that can be laid down by any one botanist or any joint committee, because it is quite beyond the power of any one except the individual monographer to decide what expression may be necessary in his individual case. But so long as each one is allowed to do what he thinks is right, there will be no end of the present trouble. What we need is a good, clear system of wholesome general rules. The practical and gradual application of these must be left to the discrimination of the individual writers, who have to describe conditions essentially different in different cases. The reader is then the judge whether the writer has succeeded in his application of the rules, whether his terminology is correct or not. No permanent international committee is needed for the purpose of acting as a guardian or a court. If a good code of rules for nomenclature is laid down, it will be followed spontaneously by all writers of any consequence, without the fear of a court of judges. If the code is a bad one, it is not worth following, and will not be accepted in spite of any supervising committee, however great its authority. It must be remembered that no matter from what association or individual such a law of nomenclature has emanated, it is and will always be temporary. It is impossible to determine upon any rules that will stand for all time, because what meets the present needs will most likely not satisfy the next generation. How long, then,

shall a writer consider himself bound to follow these rules? They will certainly have to be changed from time to time. It is especially impossible to decide upon the fixity of special terms, because a name may be founded on ideas, which, in the course of time, owing to the progress of science, will be shown to be incorrect. No such rules as are applicable to the nomenclature of taxonomy can be brought into effect in regard to a system of terminology.

The law of priority, which is the first principle in the nomenclature of systematic biology, cannot be strictly adhered to in this connection. It has been proposed by CLEMENTS<sup>2</sup> that "priority of term and of application is to be regarded as the fundamental principle of phytogeographical nomenclature." ENGLER, who must be considered as better qualified than most men to judge in such a matter, in a footnote to CLEMENTS' article expresses strong objection to the introduction of a law of priority in phytogeography. The acceptance of such a law would lead to the retaining of names which are neither expressive of the idea they represent nor suitable in other ways. If an absolute rule of priority is maintained, how are we to arrange for the retaining of names that originally expressed ideas now considered as false? Every terminology shows traces of such names. What conception in that case shall represent the type of the systematist and bear the old name? It can be seen at a glance that the rule of priority is not practicable here as it may be in taxonomic nomenclature.

The question whether to retain an old term which is not good, or to abolish it and substitute a new name, will always be difficult. If a free hand is given, phytogeography will have a heavy load of useless synonyms that always will act as a drag on true science, and create much more confusion than exists now. If on the other hand any restriction can be brought about, it must be to the effect that priority should be conceded to such a name only as has been properly defined in a work accessible to scientists. To impose new names needlessly upon previously named conceptions will always be considered bad form, and a general consensus of opinion prevails as to this habit. Suddenly introducing a large number of new terms into

<sup>2</sup> CLEMENTS, F. E., A system of nomenclature for phytogeography. *Beiblatt Bot. Jahrb.* 70: — 20. 1902.

a new science is the best way to stifle it. It is with great hesitation that a new term should be coined, and it needs in each case a specialist to decide as to the necessity for such an action. Good and forcible reason should always be shown why an old term is not sufficient to indicate the conception that is to be described. It should never be forgotten in rejecting already established names that there is a possibility that the new term may meet a similar fate from a later writer. If that were always borne in mind, perhaps writers would think twice before entering the arena as name-makers. The true test of the quality of a term is generally the time it is able to exist, provided the conception as such remains unchanged. Not infrequently, however, names are introduced into a science—phytogeography not excepted—for speculative theories and ideas, upheld and supported by facts which are consciously or unconsciously misinterpreted to fit preconceived notions. In other cases new terms are proposed for already named conceptions, because of ignorance on the part of the writer. We may here remember what DECANDOLLE says in his *Phytographie*: “the perfectly honest and right-minded botanist may sometimes have failings. He may neglect to cite his predecessors, or cite them inexactly, either from negligence or from want of literary resources. The latter case may be deemed a misfortune and no fault.” “But,” continues DECANDOLLE, “if he has not the necessary books within his reach, why not go where they are and consult them? Or if unable to do that, why need he publish?” Where a writer may have enriched the nomenclature with a new term for which no need existed, the application by subsequent writers of the rule of priority is to be recommended. If the term in question be introduced by a writer who enjoys real or affected authority, and his term is accepted upon such motives by a thoughtless multitude, it will naturally sooner or later be suppressed or ignored and finally disappear.

When we undertake to revise nomenclature and find terms the meaning of which is doubtful, the only proper way out of the dilemma seems to be to ascertain the conception given to such terms by the original proposer. If the term cannot be used in that sense it should be discarded. We have a good illustration of this in the much mistreated term “phytogeographic formation.” It was originally proposed

by GRISEBACH (1838) to designate an aggregation of plants characterized by a dominant species. But, as his examples show, GRISEBACH considered his formations as having a certain physiognomic aspect, and when in 1872 he moderated his conception of the term formation to an association characterized by a physiognomic type instead of by a dominant species, he only more pronouncedly brought forward the conception of a physiognomic unit. Leaving aside all the various uses of this term by later writers, we have to consider whether the original conception of GRISEBACH of a general plant-topographic or physiognomic unit, such as forest, steppe, tundra, or prairie, can be retained in the light of modern investigations. If that is the case the name stands, if not it falls. I have endeavored to show, in a paper now in print, that we need the term formation in the sense of GRISEBACH. Did our limits allow, we might call attention to many other instances where we could clear up the muddy stream of phytogeographical names. One more example will suffice to show how this rule would work. The word zone is now used as a technical term in phytogeography to designate at least the following conceptions: the successive belts of vegetation on a mountain side, the horizontal climatic zones of the surface of the earth, the belts of vegetation surrounding a pool or succeeding each other on a shore, the submerged belts especially of marine algae, the layers in a fossil-containing deposit; in many local descriptions it is adapted for designating any convenient floral area delimited from others; and finally in anatomy the term "zone" is applied to any area distinguished in structure from its surroundings. That this multiform interpretation of the word zone needs adjustment is manifest. In the technical language of a science a term should have only one meaning. Nothing but confusion will come from the admission of enigmatic terms, and the clarifying process is therefore the one we expect the nomenclature of phytogeography will shortly be exposed to. If in regard to the term zone we follow the principle given above, we have to ascertain what author first introduced it as a technical word, and in what meaning it was used by him. In 1839 BOISSIER designated with this term the vertical belts of plants in mountains. In a corresponding sense it had been used for a long time previously in topography, as also FLAHAULT<sup>3</sup> mentions. The

<sup>3</sup> *Projet de nomenclature phytogéographique*. 1890.

term zone in plant-geography, therefore, should signify the successive stages of vegetation from the base to the summit of a mountain, and nothing else. It is true that WAHLENBERG<sup>4</sup> in 1812 designated these belts with the term *regio*, and if we followed the rule of absolute priority, this would be the correct term. *Regio*, however, was used long before WAHLENBERG'S time by botanical writers in the general sense of a geographical area of more or less definite extension, and so was zone. In this case we are confronted with two synonymous terms, and the only principle on which a decision can be based seems to be that of general usage. It must be admitted that it is an extremely difficult matter to lay down any rules that would take us out of dilemmas such as this. If it were possible to canvass the various authors to ascertain which term has been used more than the other to designate this special feature of mountain belts we are considering, it is very doubtful at what result we would arrive. Region, however, since MARTIUS used it in 1831 for a certain phytogeographical area, has generally been understood and adopted by the best writers for that purpose. FLAÏHAULT has made the relation and usage of these two terms, zone and region, clear by adopting them in the sense advocated above. If that is universally done, we have to find other appropriate terms for the various conceptions that often have been called zones. Nor need we take refuge to the method of making new terms in this case, for we only have to make a selection from the multitude of expressions already used, and in selecting we can make a choice that will serve in other languages as well as our own, and thus to some extent satisfy the call for an international nomenclature.

The first and most essential principle of nomenclature is clearness. To obtain this result, all the expressions used in technical terminology, whether they be old established names or newly coined ones, must be definite, concise, perfectly distinctive, and easily intelligible.

All names and terms are for the sake of convenience. In order to insure mutual intelligibility, greater precision, and clearness, it is imperative to avoid names that will create error or ambiguity. It is not inconceivable that the need of short compendious names and terms to denote phytogeographical facts or processes can be met

<sup>4</sup> Flora Lapponica. Berlin. 1812.

by individual monographers following certain general principles, which should be applied with all possible generality. *Festina lente* is the maxim into which we might condense the prevalent, but perhaps not yet outspoken condemnation of the tendency to drown our science in a torrent of unpronounceable so-called international terms, which cannot but embarrass the student, render the subject less accessible and more difficult to handle, and be exasperating to lovers of a clear, consistent, and uniform nomenclature.

Emphasis must also be laid upon the manner in which a term comprises the idea it is to convey to the reader. In systematic biology it is now held that a name need not contain any reference to the subject it represents, and may be wholly meaningless. This would hardly be convenient, however, in a system of terminology. The limitation of human memory makes it important that the term or name employed in a descriptive science should not be merely a name, but also associate in one form or another our thought with the subject we are discussing. In making new terms or in discriminating between already existing ones we should bear this in mind. It is just as easy to coin a name of this kind as it is to make a meaningless one. There might be a tendency to attribute too much importance to the meaning of a name, but all things considered it seems easier to remember a term that at once conveys to our mind the conception it stands for.

It has been recommended by several writers that we ought to avoid having names that are already used in geology or some other science nearly related to phytogeography. It stands to reason that such a course is neither absolutely necessary nor very advisable. Although we speak of stratification in connection with sedimentary processes in dynamic geology, it does not follow that the term stratification could not be used in plant geography to designate the division of a plant community into strata, without implying any ambiguity or causing any confusion. Objection has been made in regard to certain terms such as formation and province, the former word being used in geology, the latter in a political sense. If we were consistent, a great number of names which have been used for a long time in botany ought to be ruled out, because they are also used in zoology, or *vice versa*, as anatomy, cytology, heliotropism, parasitism. Any

small inconvenience that may result from this principle of ignoring the fact that a term is already established in another science would be counterbalanced by the appropriate use of similar terms to designate related phenomena in related sciences.

It is of importance in applying technical terms or inventing new names to take a broad view of the subject, and not use geographical terms, that generally refer to large areas, to signify local phenomena. We might mention as an example the use of the expression Austral zone for a phytogeographic area of North America. It has always been understood, however, that the term austral refers to the southern hemisphere, and it is as wrong to use the word in the way mentioned as it would be to apply its counterpart boreal to the northern part of Brazil or Australia. It would be greatly misleading if a botanist, say in Australia, would designate for instance the eastern coast region of that continent as the Oriental region.

When LINNAEUS brought about the reformation of systematic nomenclature he freed the names from the cumbrous descriptive phrases by assigning to each object a generic and a specific name. Similarly a concise mode of expression in phytogeography ought to be agreed upon, so as to save a great deal of verbosity which at present naturally must accompany an exact and complete phytogeographical description. The difficulty of presenting the results in a compact form would not be very much bettered, however, by adopting suddenly a number of new terms, because most likely the remedy would in that case be worse than the disease. It may be safely said that by instituting a uniform method of applying necessary terms, and by bringing such an agreement into universal practice a long step would have been taken towards establishing order.

The question of obtaining a nomenclature of an international character has been discussed to some extent. There can be no doubt as to the beneficial results that would follow the adoption of such names. The practicability of the application of any rule to that effect, however, seems somewhat doubtful. Be that as it may, we are justified, I think, in looking forward to some kind of tacit agreement in this case between plant-geographers of different countries.

Another question is how such international terms should be formed. **WARBURG** and **CLEMENTS** think that only Greek and Latin



can be used. FLAHAULT, NILSSON, WARMING, and ENGLER, among others, are of the opinion that vernacular names ought not to be excluded. While it seems absolutely imperative that in referring to plants we should use only the scientific name, it does not appear to be so overwhelmingly important to change all those terms of vernacular origin, which already are established in phytogeography, into quasi-international substitutes drawn from Greek or Latin. In the former case we have thousands of names, and consequently we use the accepted scientific names, which can be easily identified, instead of the vernacular, as the latter would surely give rise to confusion. On the other hand, the number of technical terms in phytogeography is fortunately not yet so great as to make the list a very voluminous one. Even if vernacular names are retained, or introduced to designate certain facts, this would not militate against a uniform nomenclature so long as the names are clear and do not give rise to any doubt as to their significance.

One fatal objection to a change into Greek-Latin of such commonly understood and accepted names as tundra, prairie, chaparral, scrub, savannah, and others, is that in spite of the adaptability of these ancient languages, it is impossible to translate these terms adequately, since the ancients did not have any conception of the ideas or facts these names represent, and any attempt to fabricate a modern name from the ancient languages to signify, for example, the formation known as the patana of Ceylon would be a failure, so long as we want the term to suggest to our mind the peculiar conditions that characterize this particular formation. If we consider the chief object of nomenclature to be to serve our convenience, I fail to see why the name patana would not be acceptable in any language, and thus be international. As a matter of fact, it is so already, and in all probability very few persons would approve of a Greek-Latin equivalent coined according to the principle of constructive naming. CLEMENTS, who is the principal advocate of the latter method, and who has augmented the labor of those who are endeavoring to find a way in the labyrinth of phytogeographical terms by proposing at least 500 new names, has given the name psilium to a prairie formation, deriving this "international" term from *ψιλείου* or *ψιλά*, bare, naked. Now this new name does not convey any idea of a prairie

to the reader because it can be applied as well to any treeless formation. Prairie, on the other hand, is a term well-known to every school-boy the world over, and there is no need whatever to overload memory with a new name that serves no useful purpose. For the term "bad lands" of Nebraska CLEMENTS suggests hydrotribium, and for plants on that formation hydrotribophyta. Terms such as these are very expressive in a way, but they are certainly not an improvement. The English "bad lands" applied to this particular formation is widely known, it causes no ambiguity, and there would be no objection raised against its acceptance in French, German, or any language, but most people would certainly protest against hydrotribium. And still this last term can be pronounced, but what about ptenothalophyta, rhoium, ammochthophilus, proodophytia, mesochthonophilus, chosen at random from CLEMENTS' catalogue? The terms rolling prairie, rolling foothill, rolling downs, and so on, can readily be adapted in any language, and be just as characteristic as if we translated them into some more or less high-sounding name derived from the Greek word for rolling, or wheel, or ball, or some similar expression. In geology many characteristic words have been borrowed from the vernacular for technical use, as fjord, atoll, and canyon. Would physiography have been better off in regard to clearness and brevity of expression if names of mixed Greek and Latin origin had been invented for these conceptions, which had no equivalent in the language of the ancients? ENGLER, in the footnote to CLEMENTS' article already referred to, gives the following categorical judgment in this matter: "dass es sich nicht empfiehlt, die volkstümlichen Bezeichnungen von Pflanzenformationen aus der pflanzengeographischen Literatur zu verbannen."

What has here been said may suffice to show that new names cannot be invented to advantage for features that already have well established and characteristic designations in the vernacular language of the country where they constitute a salient feature. Good common sense in this as in many other cases must be the guide in choosing technical expressions.

If a suggestion were offered as to the first step necessary in order to obtain uniformity, it would be that we have to decide about the various kinds of floristic, topographic, and ecologic units that can be

and are necessary to distinguish. It has been suggested<sup>5</sup> that the division of the vegetation into formations must be founded upon the concept of habitats. This principle is a good one, the only difficulty seeming to lie in the practical working of the rule. Any one conversant with the great variety of forms of habitat is aware that such a classification is no easy undertaking. In all attempts made the authors have decided for one or another environmental factor that has influenced the development of the formation, and consequently the classification has been more or less artificial. The task of identifying, classifying, and naming plant aggregations, or features of the vegetation, is extremely difficult because of the comprehensive data necessary to illustrate the complex factors influencing distributional phenomena. The use of one class of names that refer to habitat, however, are inevitable and absolutely necessary. For such terms we can turn to the vernacular language, which often possesses very expressive names that combine in one word the main features of environment. Together with the term formation as representing the large topographical units of vegetation such vernacular terms are very adequate. Let me give a few examples to illustrate this. The chaparral formation of California and southwestern United States generally is one of the most peculiar anywhere. There can be no doubt about the meaning and scope of the term, when the formation has once been clearly defined, because it has no counterpart in any other region of the world, although it certainly is paralleled in many places by related formations. The expression chaparral formation gives not only a general idea of the component plants, but it also includes a conception of the topographic aspect of the country where the formation occurs, and whose physiognomy it assists to mold. Still the term is strictly devoid of any reference to the dominant species concerned in the aggregation of plants in any part of the formation. Formational names should always be so. A formation can be subclassified into associations, and these into communities. The latter can be designated adequately by adding the suffix *etum* to the scientific name of the dominant plant after the method first suggested by HULT.<sup>6</sup> The limitations of this article do not allow me

<sup>5</sup> CLEMENTS, *l. c.*

<sup>6</sup> Försök till en analytisk behandling af växtformationerna. Medd. Soc. F. Fl. F. 8:1-155. 1881.

to enter into details with regard to this method of classification, which I have found works equally well in the arctic parts of Europe and in the Mediterranean countries; in the primitive tropical forests of Ceylon, northern Australia, and Polynesia, and in the semi-arid regions of New South Wales and Western Australia; in New Zealand and in California. I may say that in my work in these countries I have not found it necessary to introduce any new system of naming, but merely to coordinate and classify previously existing conceptions. And I firmly believe that this working out of the synonymy will be the only method by which a final agreement can be reached.

We have further to classify all the units of one kind or another into groups according to relationship, and to give names to them, availing ourselves as much as possible of terms already existing, the synonymy of which must be cleared up thoroughly. After laying down the general principles of nomenclature in the code to be recommended, we have to leave the application of these canons to the individual writers.

This should be the program for a permanent committee to be appointed by the next international congress. Let this body then publish the results of their work and submit them for leisurely consideration and discussion. When conflicting opinions, if there are any, have been expressed, and direct or circumstantial evidence has been brought in to illustrate and reinforce the various principles, it is time to settle the matter by adopting a general code of nomenclature. There can be no hope of getting any substantial improvement in existing conditions through any immediate action of the botanical congress, because of the great diversity of opinion and practice that prevails, and because no definite proposal based on facts and logical arguments has yet been held forth which could be made subject to a detailed criticism. Any proposition that presents principles or terms without proper and clear definitions can naturally not be considered.

The question may arise as to what constitutes a definite description. The degree of exactness and clearness of expression will naturally vary with the different authors, but so long as there remains any doubt as to the feature meant by the writer his term can hardly expect to be generally accepted.

*Nomina nuda* in the sense of systematic biologists appear not infrequently in phytogeographic literature, and it must always be considered as insufficient definition to supply merely a translation of a formational name, without giving a description sufficiently clear to remove every trace of doubt as to what the writer has described.

Whenever coining of pseudo-classical names is resorted to, it is to be expected that the author would at least take into consideration some degree of linguistic purity, besides the matter of precise meaning, because it is important that terms which are also to be spoken should be euphonious and in some harmony with the pronunciation.

In regard to the rules of coining new terms from Greek and Latin it has been claimed that the classical languages only should be considered. Rules of that kind are difficult to follow. In the real classical Latin, for example, the words are used in so many different ways that it will often be difficult to bring them into conformity with the primary rule of technical nomenclature that each idea should be represented by a single term only, and each name should have only one meaning. The classical Latin of botanists has been the Latin of Linnaeus, and it will most likely always remain so, because of its definiteness and conciseness. Whatever language is chosen, in the forming of new words we must follow the rules of the language; but we must also remember that by driving the systematizing too far we will only increase the difficulties, and by a too sedulous adherence to preconceived notions we might arrive at results which are not in unison with the true progress of science.

One important point is that in forming new terms for phytogeography we must avoid terms which already, in one form or another, are used in botany. To call an orchard formation dendrium will lead to difficulties, because that name is already used to designate a genus of plants. The same objection can be made to eremia, amathia, lophia, petria, xylia, and scores of other terms proposed by CLEMENTS.

The rule suggested by that author "that a term to be valid must be proposed by a botanist" is incongruous. In hazarding this criticism I must confess that it appears to be a hard rule that forbids any one who has facts to present concerning the vegetation or flora from doing so, provided he is able to express himself correctly, no

matter whether he claims the title of botanist or not. Or is it the coining of names only that should be restricted to botanists? Who is a botanist? Where shall the limit be drawn? Does knowledge of a certain number of plants entitle a man to this privilege? Or is publication of a certain number of pages on some botanical subject a sufficient qualification? If such a rule were accepted and applied, we should have to reject, for instance, the term "ecology," because it was first introduced by ERNST HAECKEL, who never claimed the name of a botanist, although he knew more about the subject than most "botanists."

Enough has been said upon this matter. We should take up a conservative position in this question of nomenclature, but at the same time insist upon the adoption of a code announcing certain principles, the application of which will prevent such a plentiful harvest of confusion as we have now, and assist in bringing about a reform resulting in a nomenclature better adapted to the needs of scientific workers. "Prove all things; hold fast that which is good" is the very essence of such a code.

To summarize the previous discussion:

Clearness and conciseness are the main requisites for a system of terminology.

Each technical term should have only one meaning.

In case of doubtful terms consult the proposer of the name. If the conception it represents is not absolutely clear, the name has no status in nomenclature.

If a term has been commonly used and understood in another sense than the original author proposed, it should be retained, but only in case there can be no doubt as to its interpretation.

If a conception has already received a name and there is no obvious reason to discard that name, an author has no right to propose a new term.

A law of priority is practicable, we think, only so far as the principles laid down in the previous pages of this article will admit.

A name, the conception of which has been materially changed in the course of time, naturally has no standing.

A technical term should be associated in our mind with the idea it represents.